

GPS/GNSS SMD ANTENNA CENTER MOUNT

Part Number: LK1850101

Description: GPS/GNSS SMD Antenna Center Mount

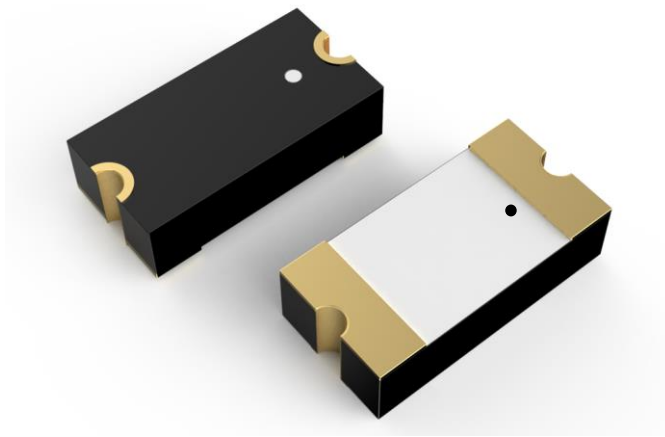
Frequency: 1165-1610MHz

Size: 3.2 mm x 1.6 mm x 0.5 mm

Features:

- ✧ Support GPS L1/L2/L5, BEIDOU, GLONASS, GALILEO and QZSS
- ✧ Omni-directional radiation pattern
- ✧ High precision with RTK
- ✧ Surface Mount Device (SMD) tape & reel supply
- ✧ Easy integration and flexible placement
- ✧ Ultra-low profile with a height of 0.5 mm

RoHS compliant



Revision: B

Apr 09, 2024

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1.0 Product Description

The LK1850101 is an ultra-low profile SMD antenna with a height of 0.5 mm. It leverages cutting-edge technology to support high precision positioning with RTK functionality. It supports GPS L1/L2/L5, BEIDOU, GLONASS, GALILEO and QZSS simultaneously. Additionally, it provides GNSS L1 band only for non-high precision applications. Its extremely compact form factor simplifies the creation of highly integrated products with a slimmer profile while maintaining superior antenna performance.

Features:

- Support full GPS/GNSS bands
- High precision with RTK
- Omni-directional radiation pattern
- Low profile with flexible placement
- SMD supplied in Tape & Reel

Applications:

- Tracker
- AGV/AMR
- Precision agriculture
- Smart meters
- Satellite IoT

2.0 General Specification

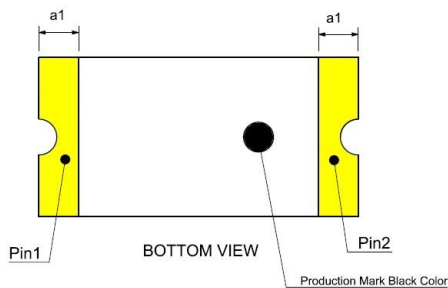
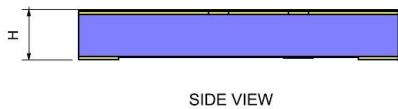
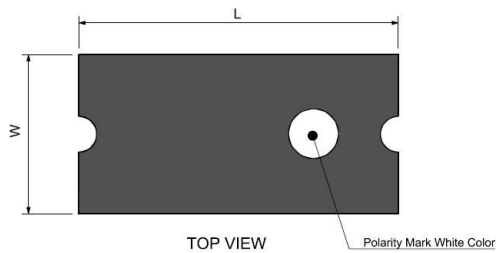
Part Number	LK1850101			
Configuration	Config A	Config B		
Frequency (MHz)	1559-1610	1176.45 +/-10	1227.6 +/-10	1559-1610
S11 (Return Loss) (dB)	< -8.0	< -10.0	< -8.0	< -10
VSWR	< 2.3	< 2.0	< 2.3	< 2.0
Average Efficiency	> 75%	> 50%	> 60%	> 60%
Peak Gain (dBi)	1.1	0.4	1.0	1.9
Polarization		Linear		
Radiation Pattern		Omni-directional		
Antenna Type		Loop		
Impedance		50 Ω		
Power Rating		5 Watts		
Weight		< 0.01g		
Operation Temperature		-40°C to +125°C		
Storage Temperature		-40°C to +85°C		

Notes:

1. The above performances are the typical values measured on the Leankon evaluation boards.
2. Config A supports GPS L1, BEIDOU B1, GLONASS G1, GALILEO E1 and QZSS L1.
3. Config B supports GPS L1/L2/L5, BEIDOU B1/B2a/B2b, GLONASS G1/G3, GALILEO E1/E5a/E5b and QZSS L1/L2C/L5.

3.0 Mechanical and Environmental Specification

3.1 Product Dimension



Typical Antenna Dimensions:

L (mm)	W (mm)	H (mm)	a1 (mm)
3.2±0.15	1.6±0.15	0.5±0.1	0.4±0.1

Pin Description:

Pin	Definition	Description
Pin1	Grounding pad	Connect to the ground plane of main PCB
Pin2	Feeding pad	Connect to feeding transmission line

3.2 Environmental Specification

Item	Test item	Test condition	Specifications
1	Temperature Cycling Test	-40°C (30 minutes) to 125°C (30 minutes) 1008 cycles	1. No apparent damage 2. Electrical properties within the test Spec.
2	High temperature high humidity test	85°C; 85% RH for 96 hours	1. No apparent damage 2. Electrical properties within the test Spec.
3	High Temperature test	1000 hours at 125°C	1. No apparent damage 2. Electrical properties within the test Spec.
4	Salt Mist test	Concentration: 5%±1 Spray time: 24 hours Ambient Temperature: 35 ± 2°C	1. No apparent damage 2. Electrical properties within the test Spec.
5	Shear force	Push from side surface (length side) after IR reflow soldering	> 2.0 Kg

4.0 Electrical Characteristics

The electrical characteristics are measured on the Leankon evaluation boards in below.



Figure 4.1.1: The evaluation board of Config A



Figure 4.1.2: The evaluation board of Config B

Notes:

- 1) To request an evaluation board for pre-verification, please reach out to info@leankon.com.
- 2) The size of Config A evaluation board is 90mm x 30mm x 1mm.
- 3) The size of Config B evaluation board is 90mm x 25mm x 1mm.

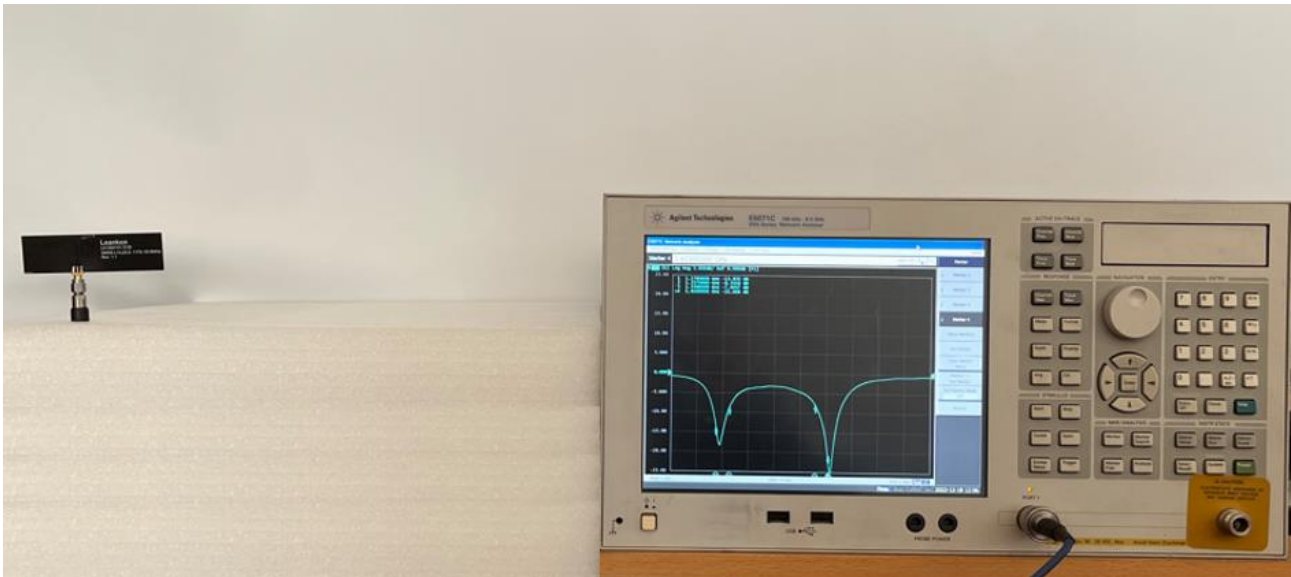


Figure 4.2: The free space test condition of Return Loss and VSWR

4.1 S11/Return Loss

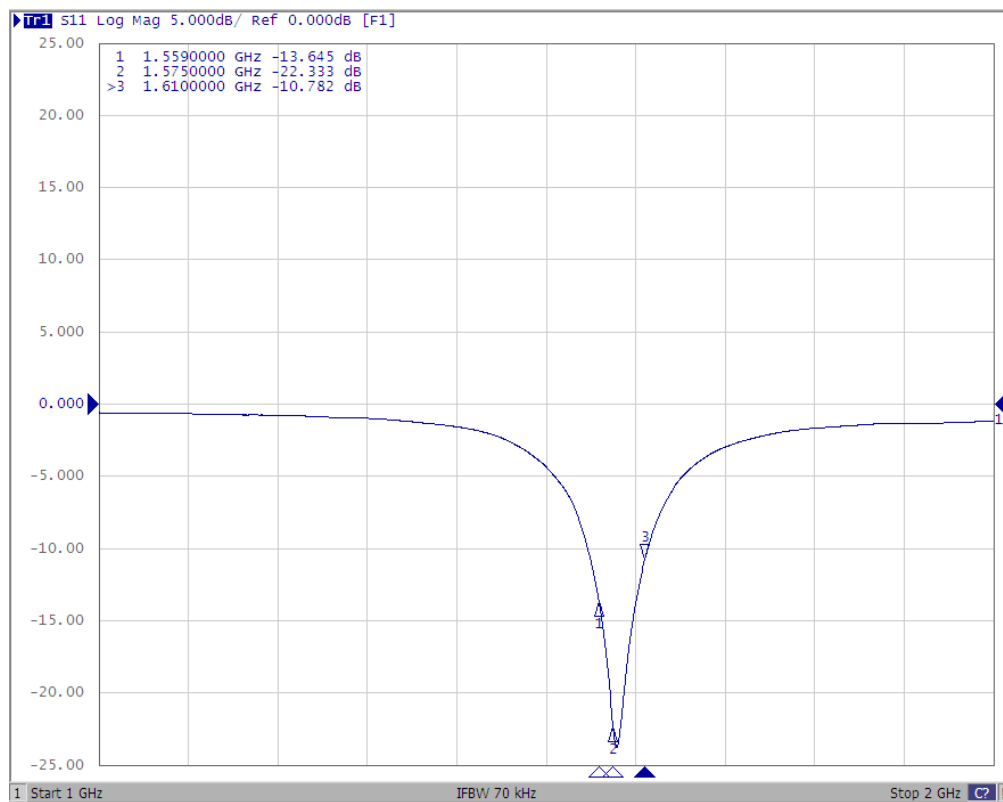


Figure 4.3 S11/Return Loss in Free Space of Config A

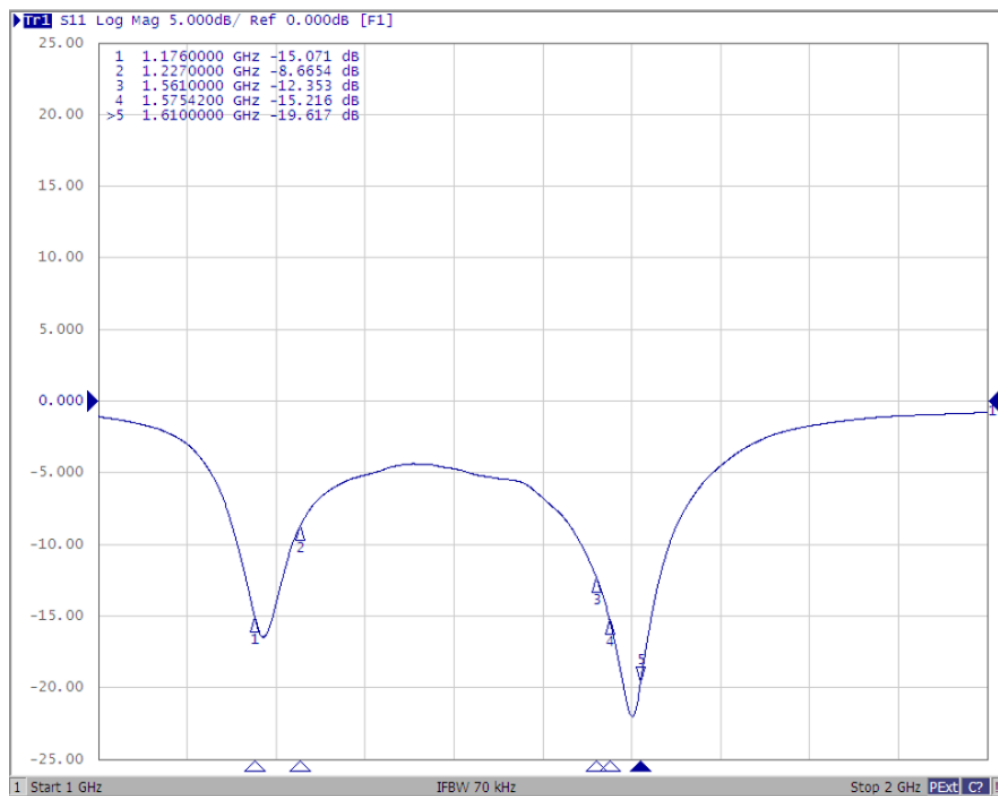


Figure 4.4 S11/Return Loss in Free Space of Config B

4.2 VSWR

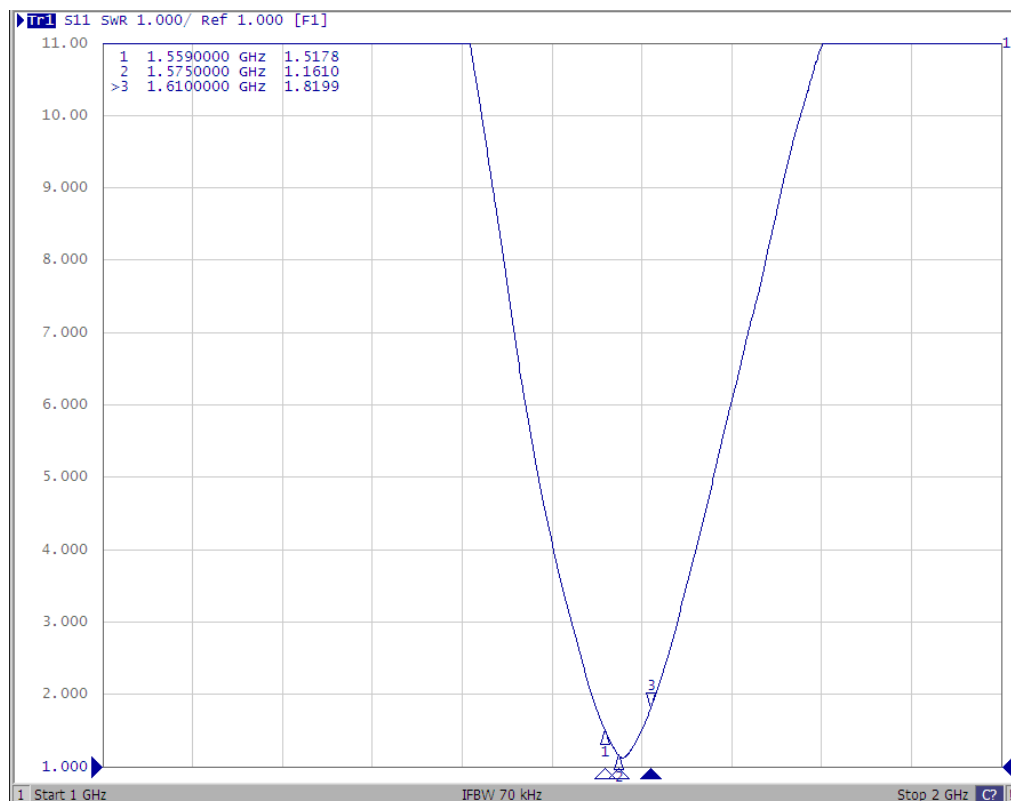


Figure 4.5 VSWR in Free Space of Config A

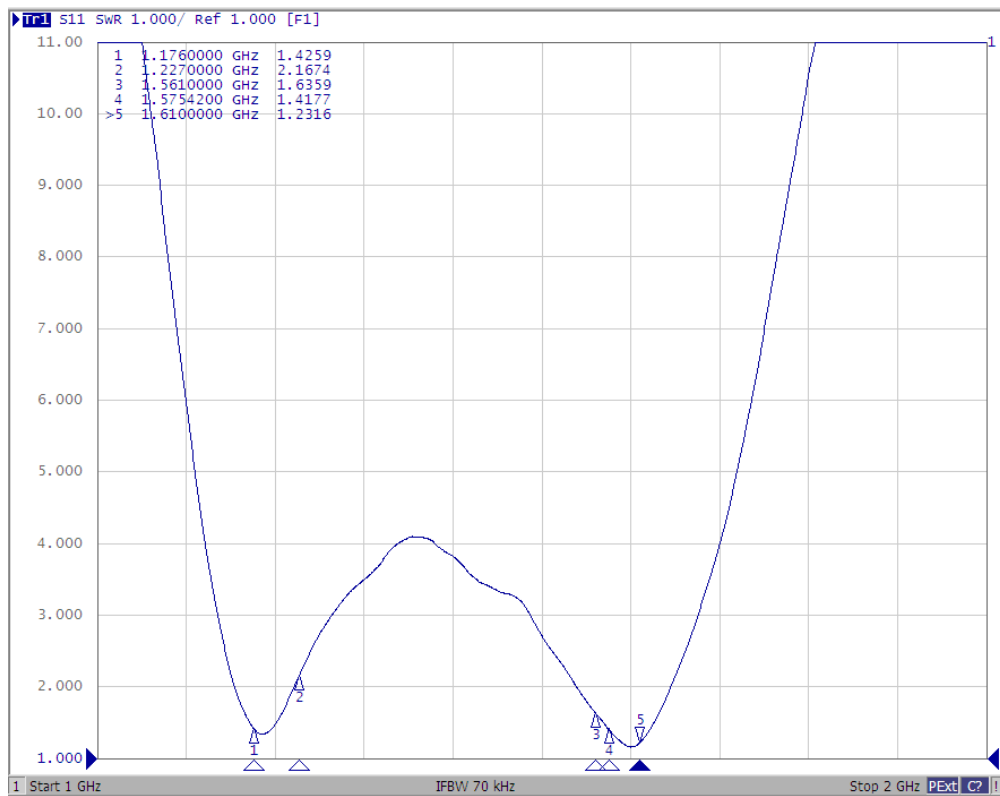


Figure 4.6 VSWR in Free Space of Config B

4.3 Efficiency

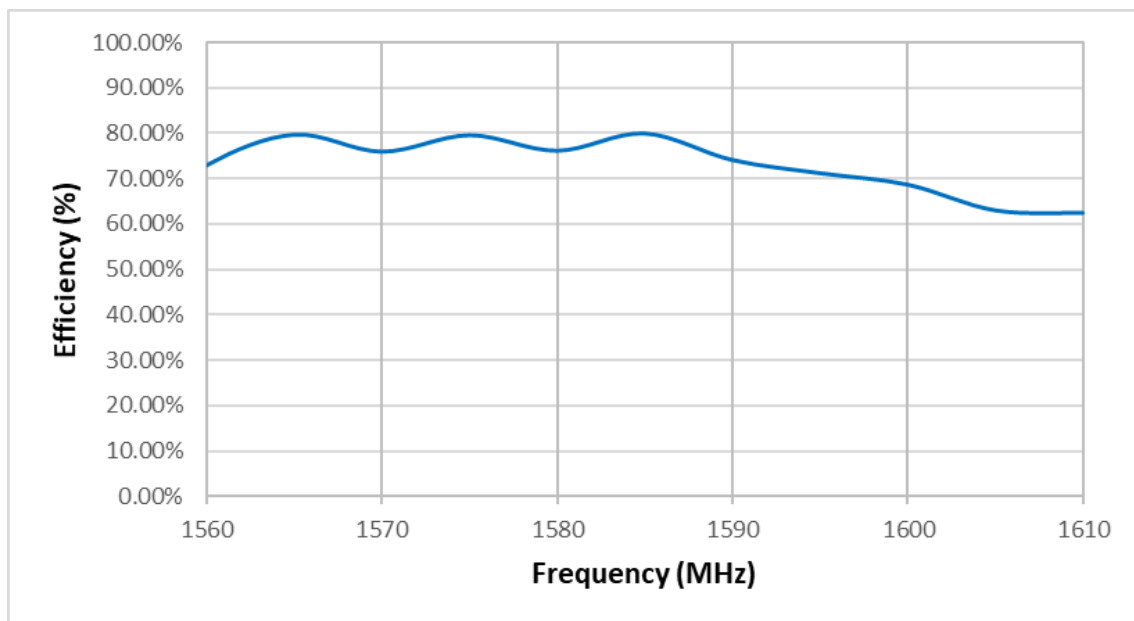


Figure 4.5 Efficiency in Free Space of Config A

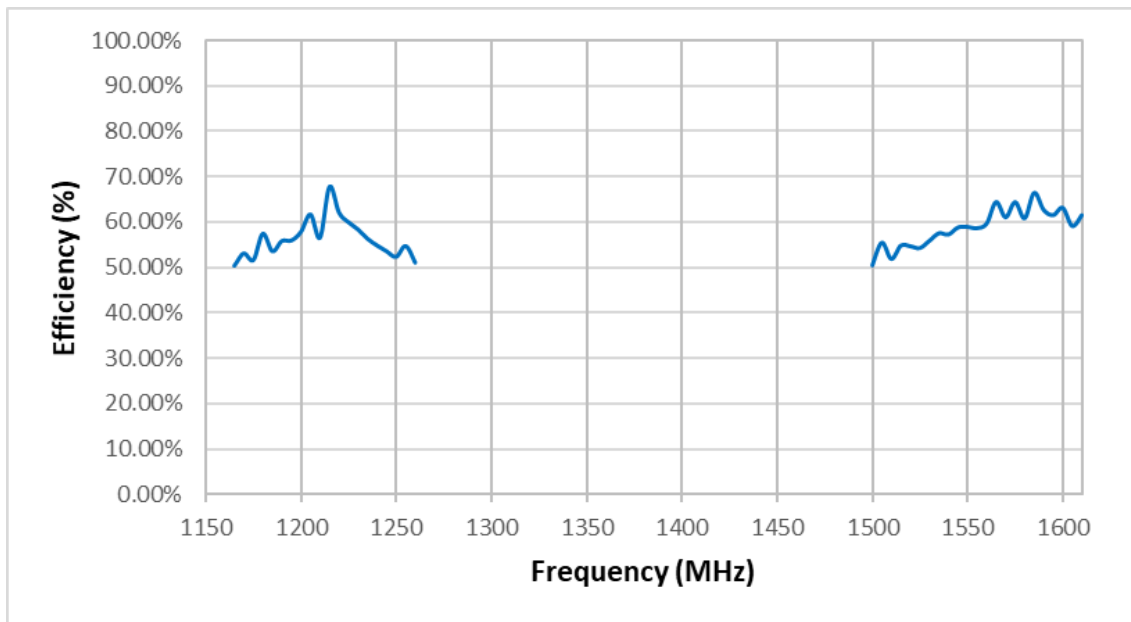


Figure 4.5 Efficiency in Free Space of Config B

4.4 Peak Gain

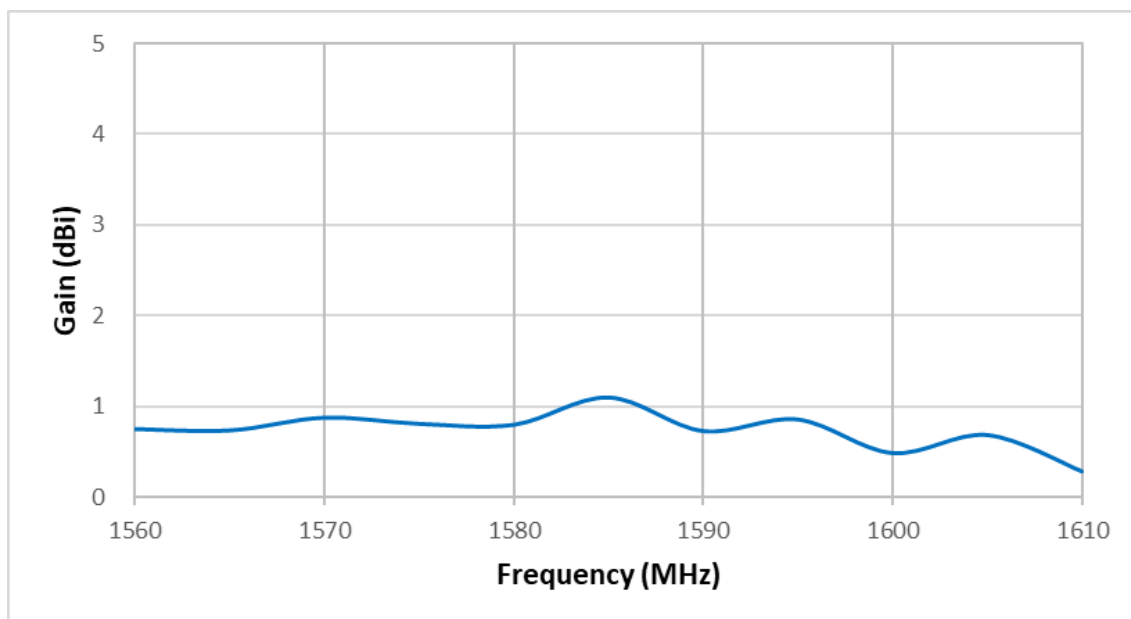


Figure 4.6 Peak Gain in Free Space of Config A

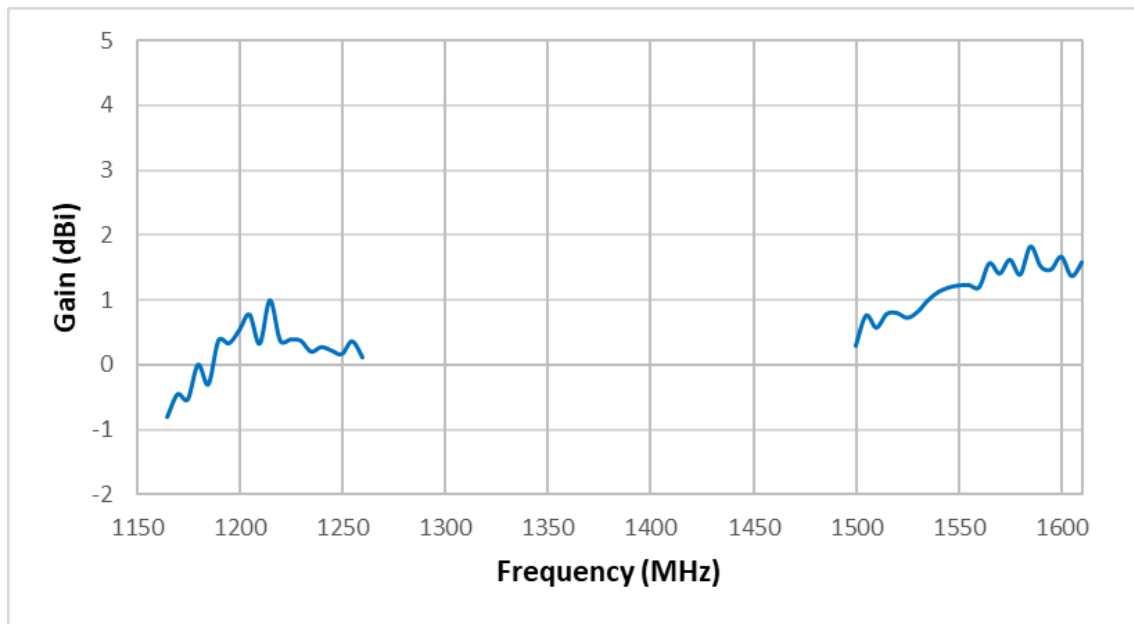
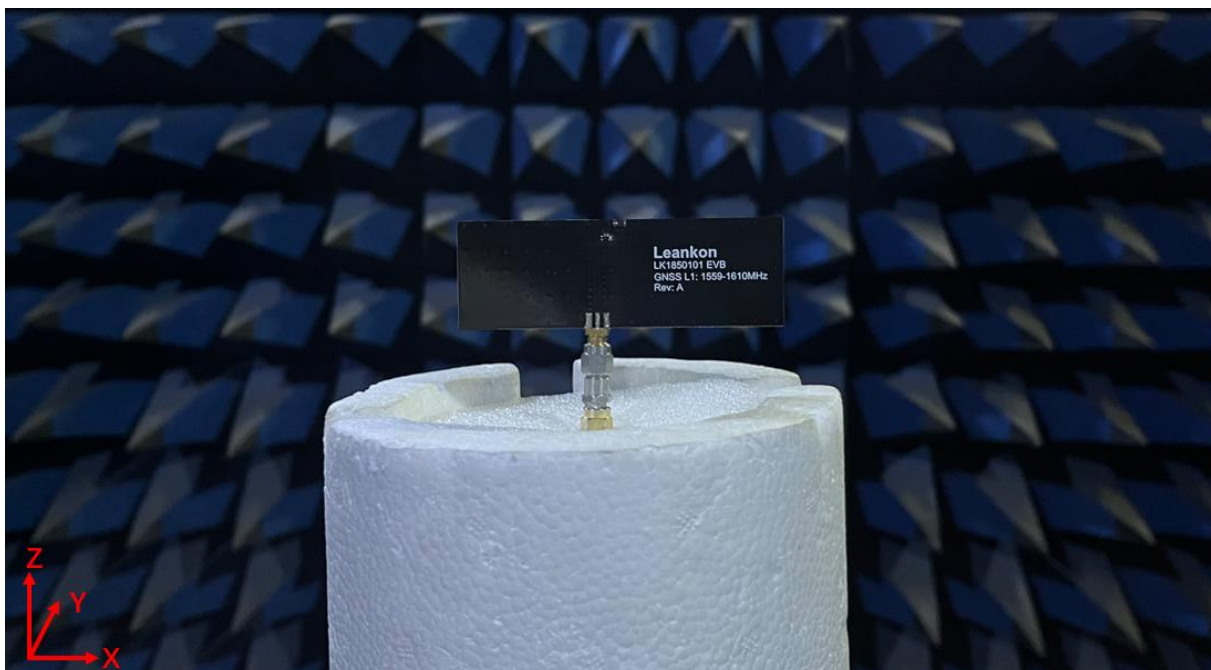


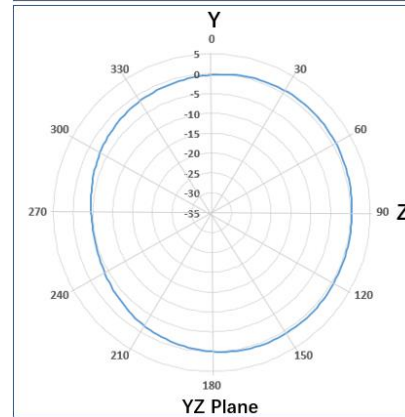
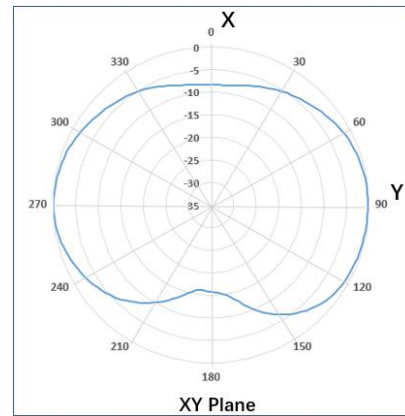
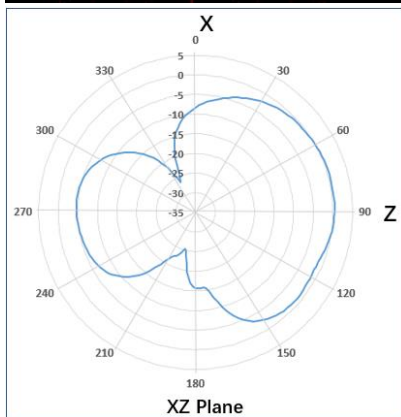
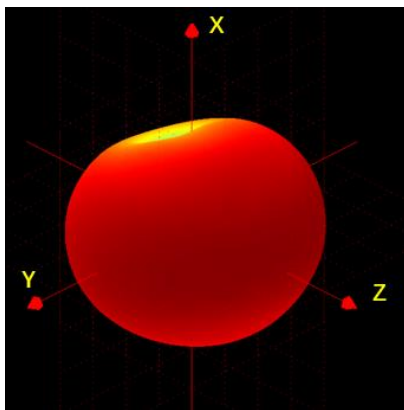
Figure 4.6 Peak Gain in Free Space of Config B

4.5 Radiation Pattern

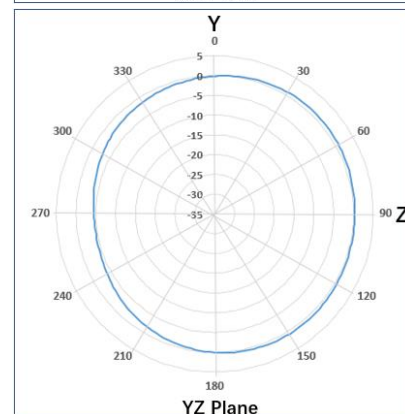
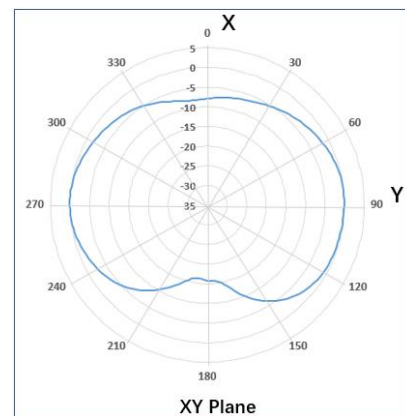
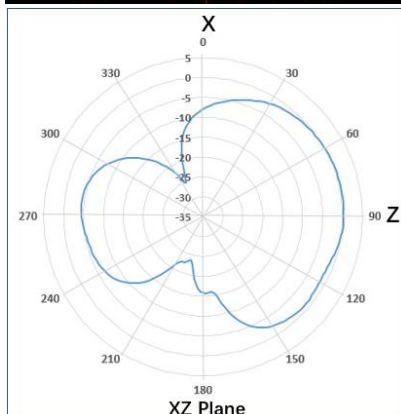
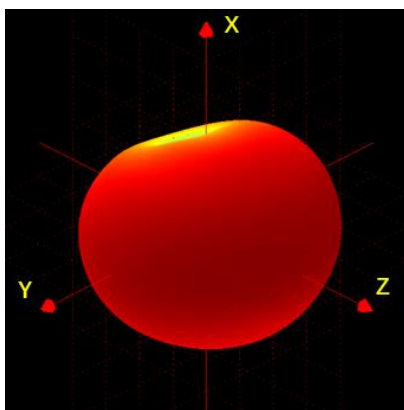
Below shows the antenna radiation pattern measured in 3D anechoic chamber.



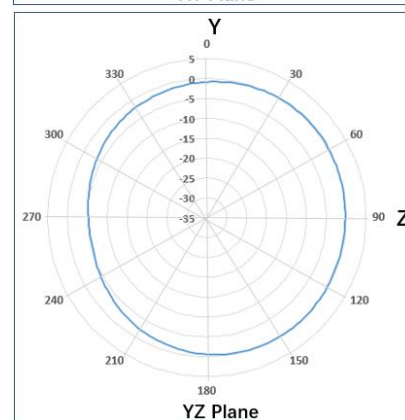
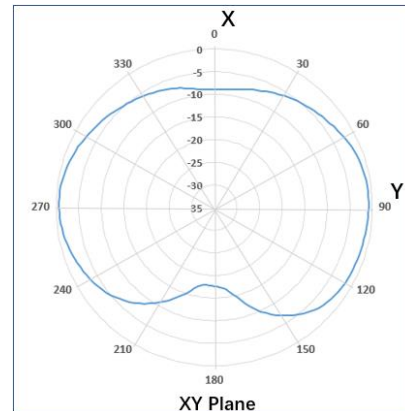
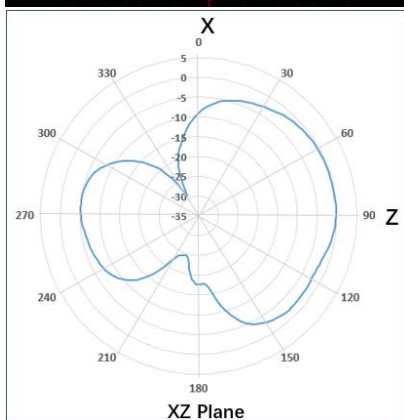
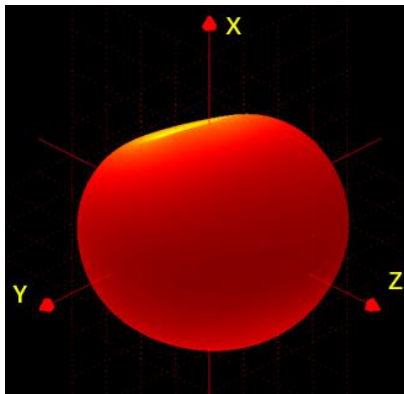
■ 1561MHz Radiation Pattern of Config A



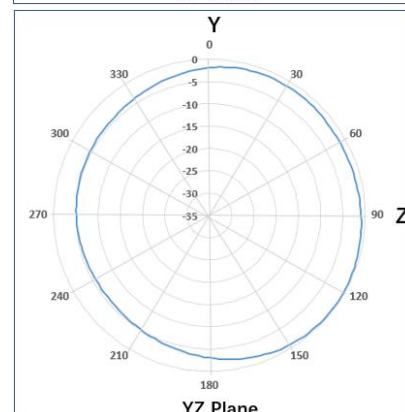
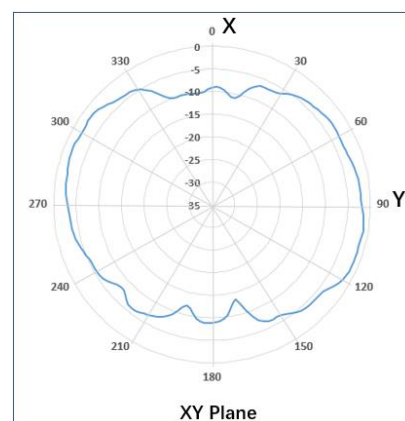
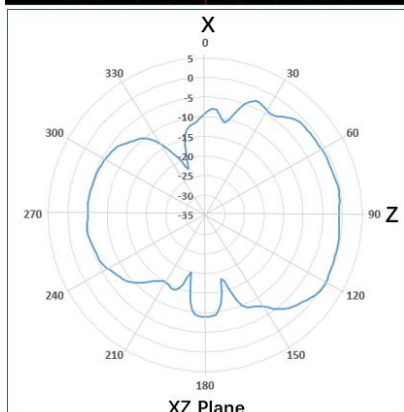
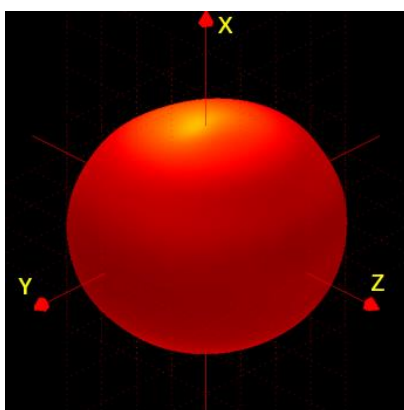
■ 1575.42MHz Radiation Pattern of Config A



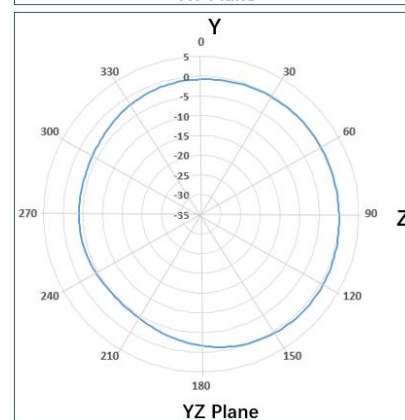
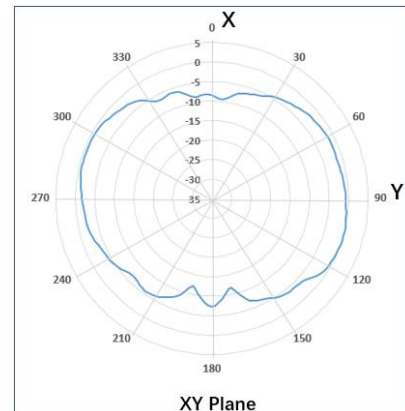
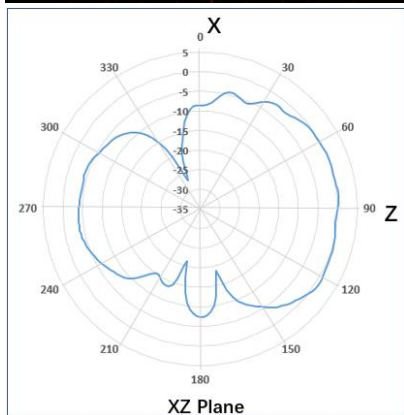
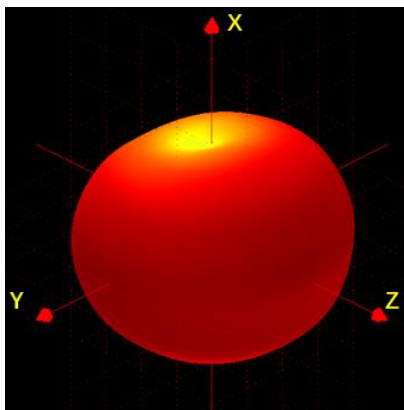
■ 1602MHz Radiation Pattern of Config A



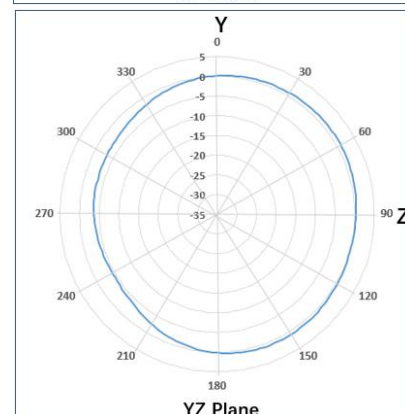
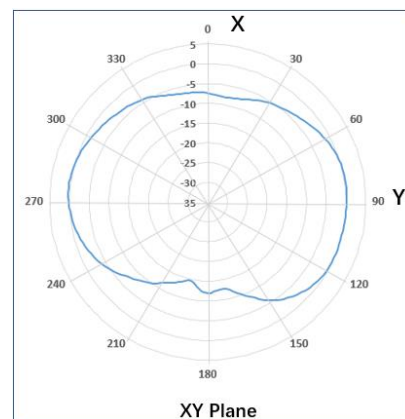
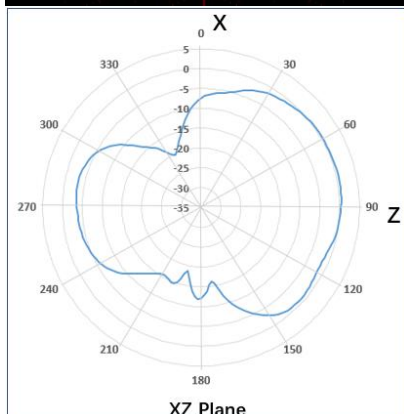
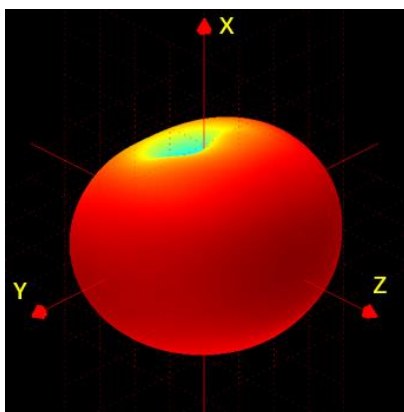
■ 1176.45MHz Radiation Pattern of Config B



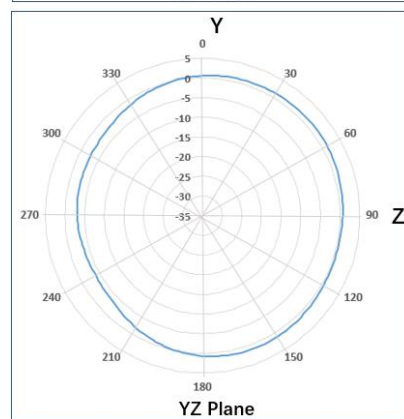
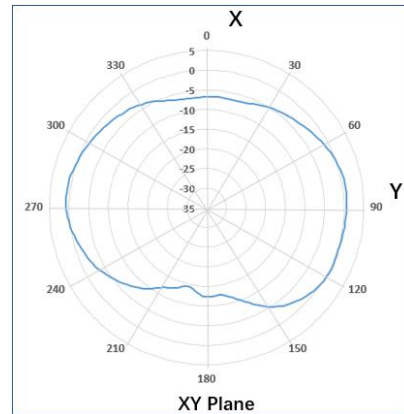
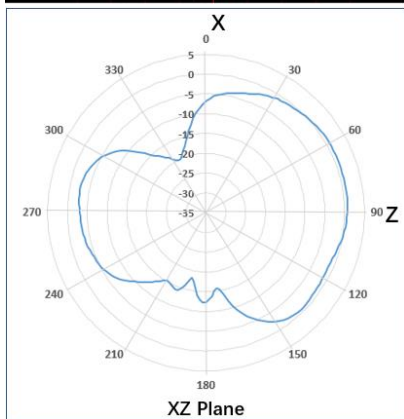
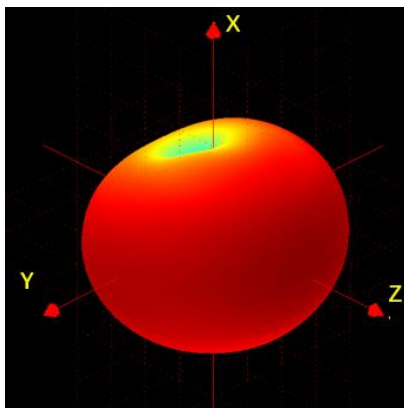
■ 1227.6MHz Radiation Pattern of Config B



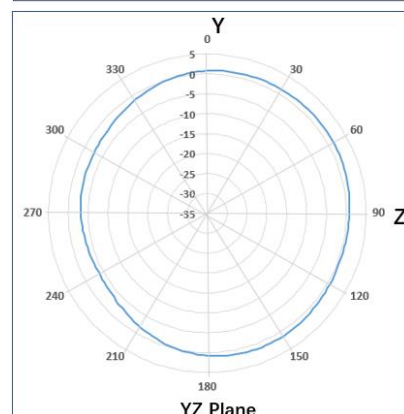
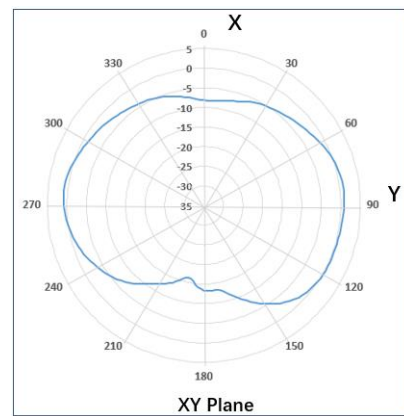
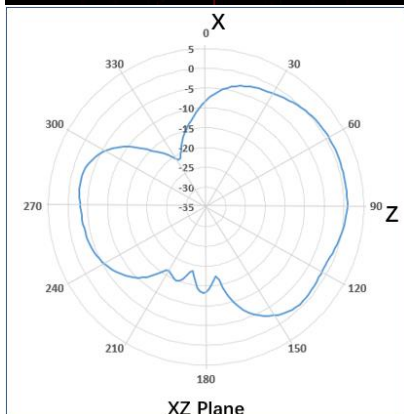
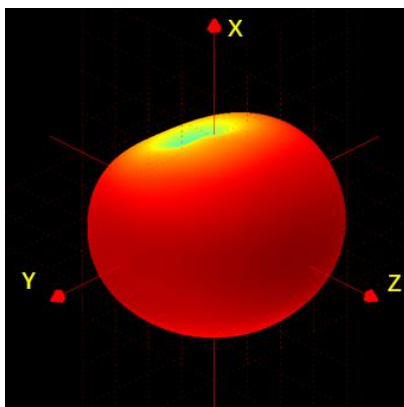
■ 1561MHz Radiation Pattern of Config B



■ 1575.42MHz Radiation Pattern of Config B



■ 1602MHz Radiation Pattern of Config B



5.0 Recommended PCB Layout

5.1 Recommended PCB Layout

To provide designer with more options, two different PCB layouts are offered for both Config A and Config B. Config A details of these two layouts are shown in Figure 5.1.1 and Figure 5.1.2. Config B details of these two layouts are shown in Figure 5.1.3 and Figure 5.1.4.

The antenna performances of these two PCB layouts are equivalent.

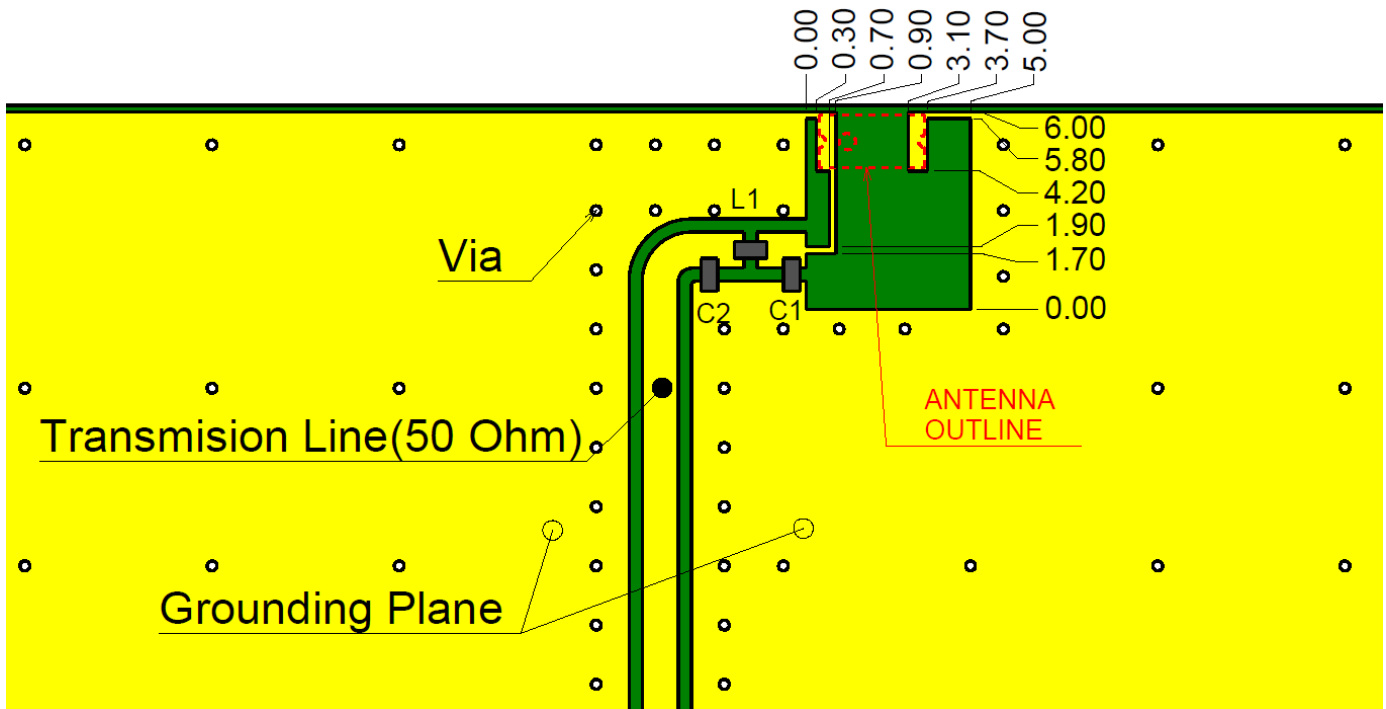


Figure 5.1.1: Recommended PCB Layout of Config A

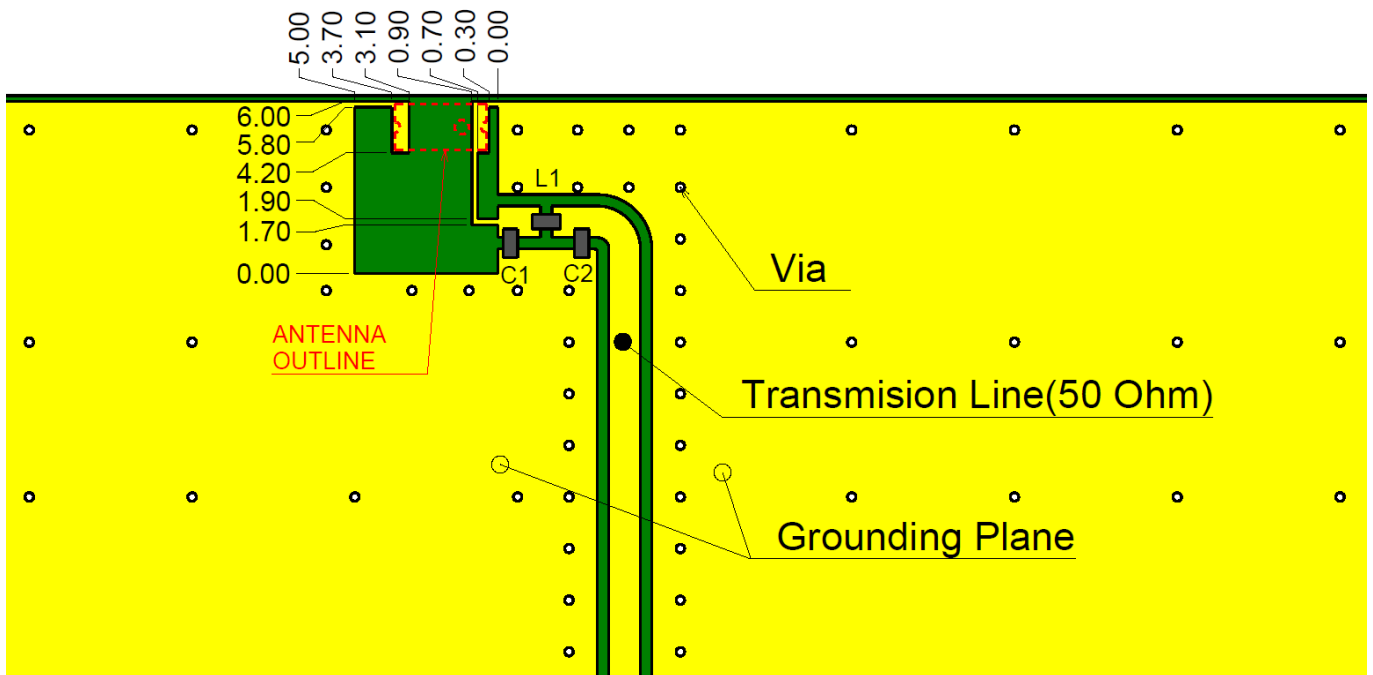


Figure 5.1.2: Recommended mirrored PCB Layout of Config A

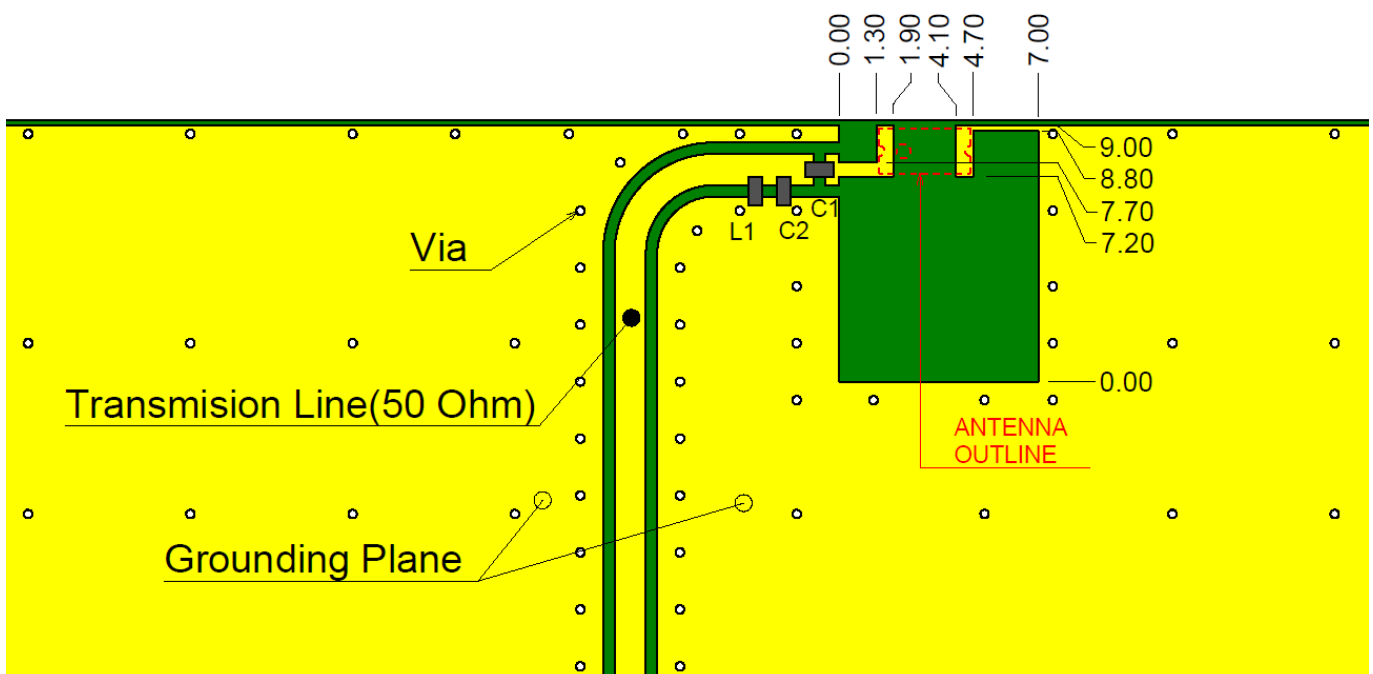


Figure 5.1.3: Recommended PCB Layout of Config B

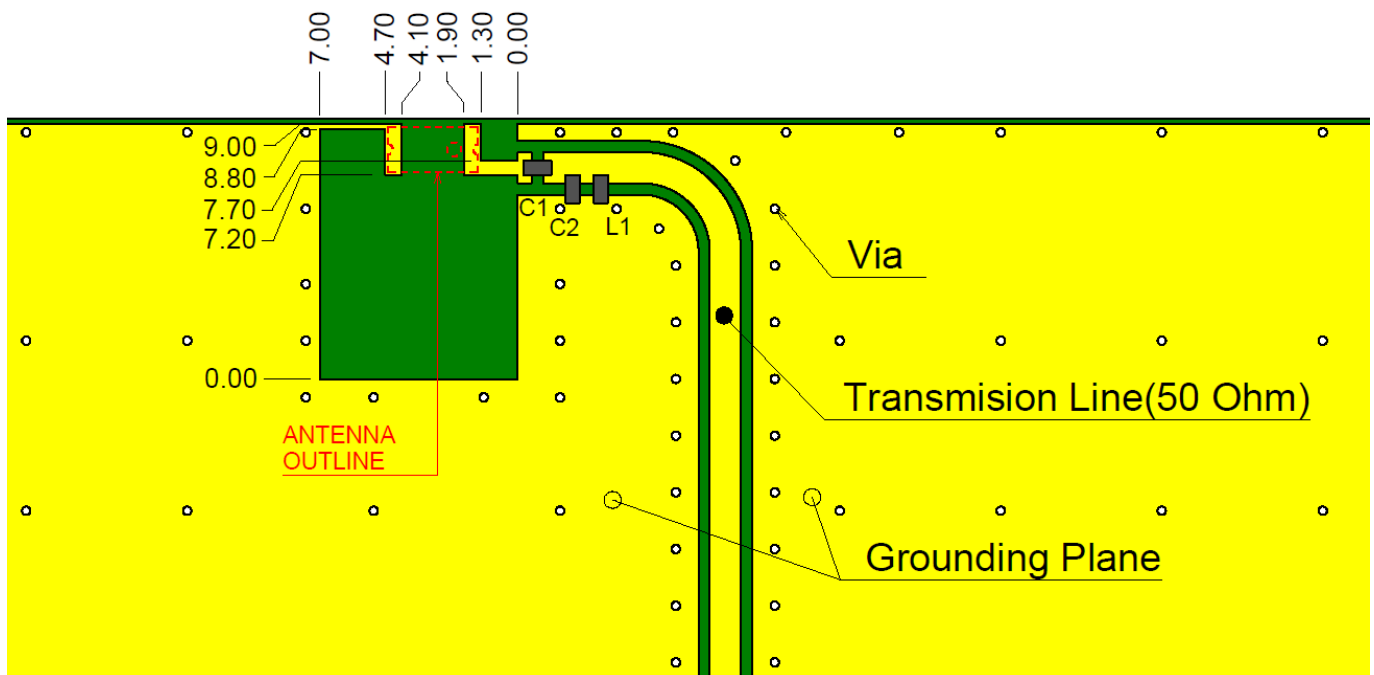


Figure 5.1.4: Recommended mirrored PCB Layout of Config B

5.2 Recommended Soldering Pad

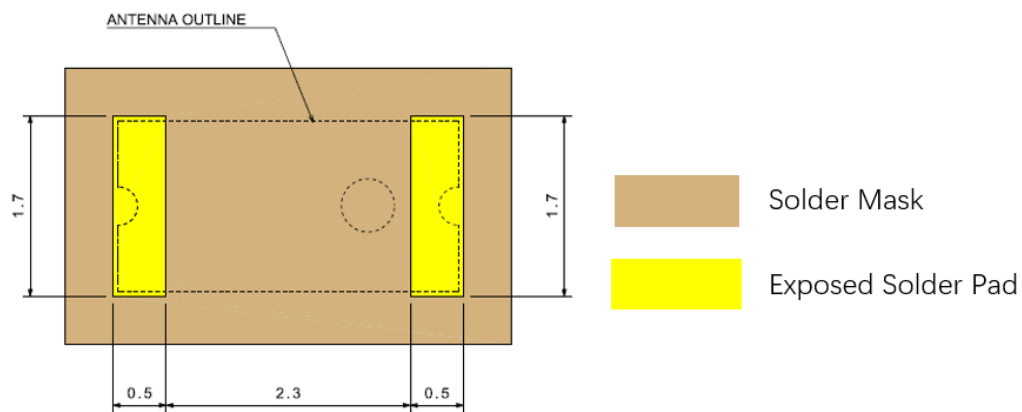


Figure 5.2.1: Recommended Soldering Pads on host PCB

5.3 Recommended Clearance Area

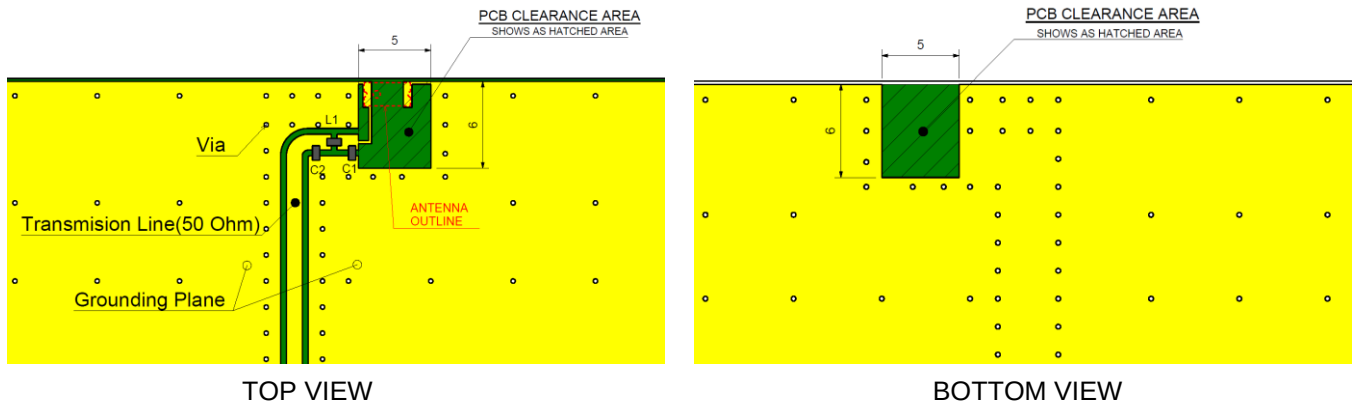


Figure 5.3.1: Recommended PCB Clearance Area of Config A

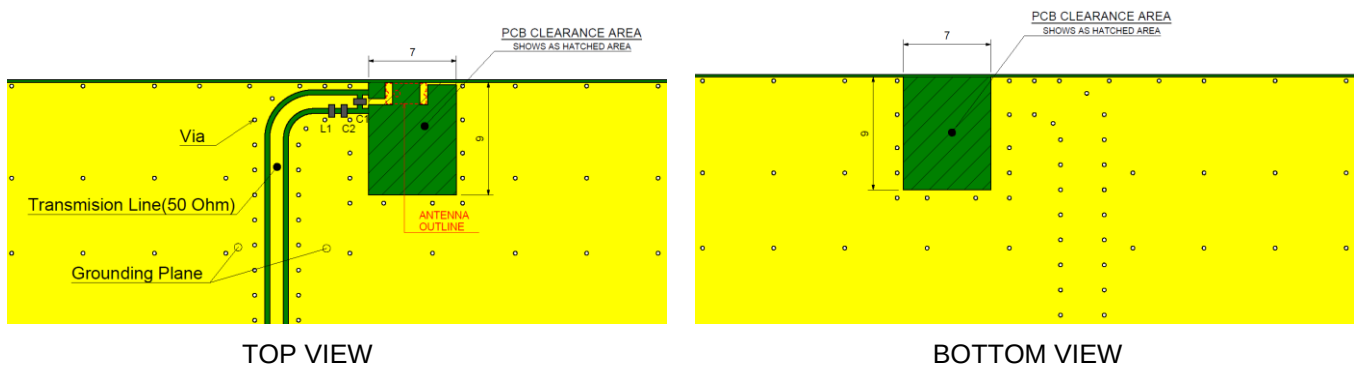


Figure 5.3.2: Recommended PCB Clearance Area of Config B

Notes:

1. The term “clearance” also refers to “keep out”.
2. The Config A clearance area is 5.0 mm x 6.0 mm.
3. The Config B clearance area is 7.0 mm x 9.0 mm.
4. In all PCB layers, the clearance area must be free of ground plane or metal for both Config A and Config B
5. The clearance areas are the same for mirrored applications.

5.4 Antenna Placement Application Guidelines

LK1850101 provides flexible antenna placement for different PCB sizes. Assumed PCB size is X (mm) by Y (mm), as shown in Figure 5.4.1:

- 1) When $Y > X$, the location 1 is recommended.
- 2) When $Y < X$, the location 2 is recommended.
- 3) The guidelines are applicable to both Config A and Config B.
- 4) To achieve optimal antenna performance, it is recommended to position the antenna at the center edge of the PCB or as close to the center as possible, regardless of the conditions mentioned above.

Leankon also provides antenna location recommendations and antenna performance simulations based on your specific PCB shape and size. Please email us at info@leankon.com with your detailed inquiry.

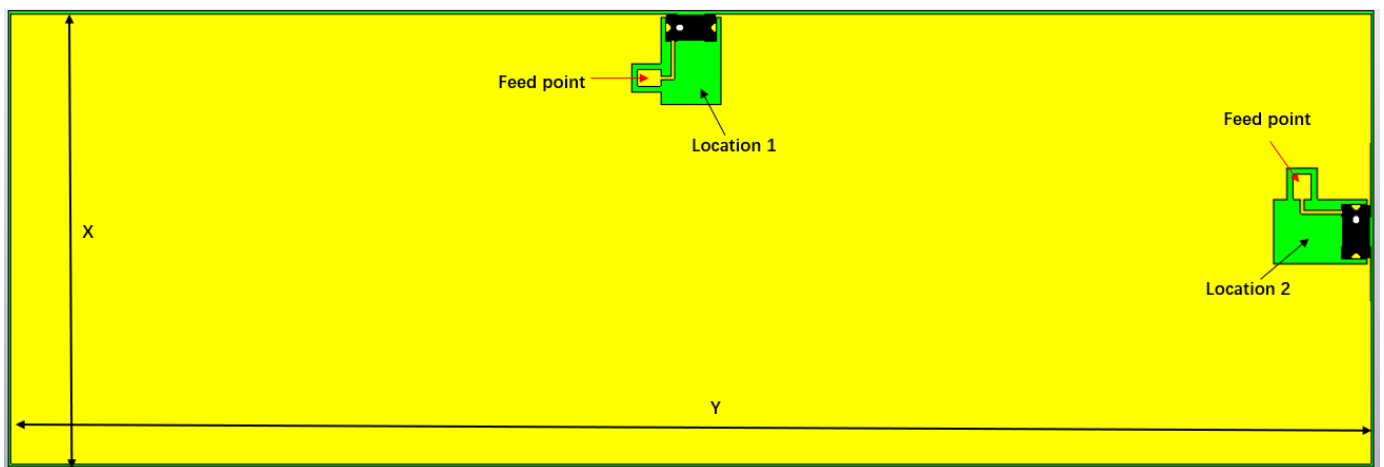


Figure 5.4.1: The antenna placement of LK1850101

The antenna can be placed on either the top layer or the bottom layer of the host PCB. The following demonstrates the three mounting methods on the host PCB. Mounting the antenna on the same layer as the module is preferred to minimize transmission line loss.

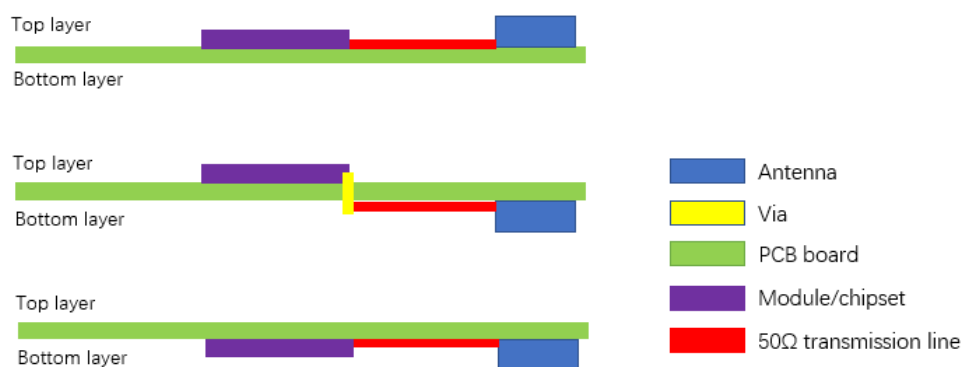


Figure 5.4.2: The antenna placement on host PCB

6.0 Matching Network

A matching network is proposed on the host PCB to maximize impedance bandwidth for both Config A and Config B. It is highly recommended to design the PCB layout according to the reference matching component positions provided below for optimal antenna performance.

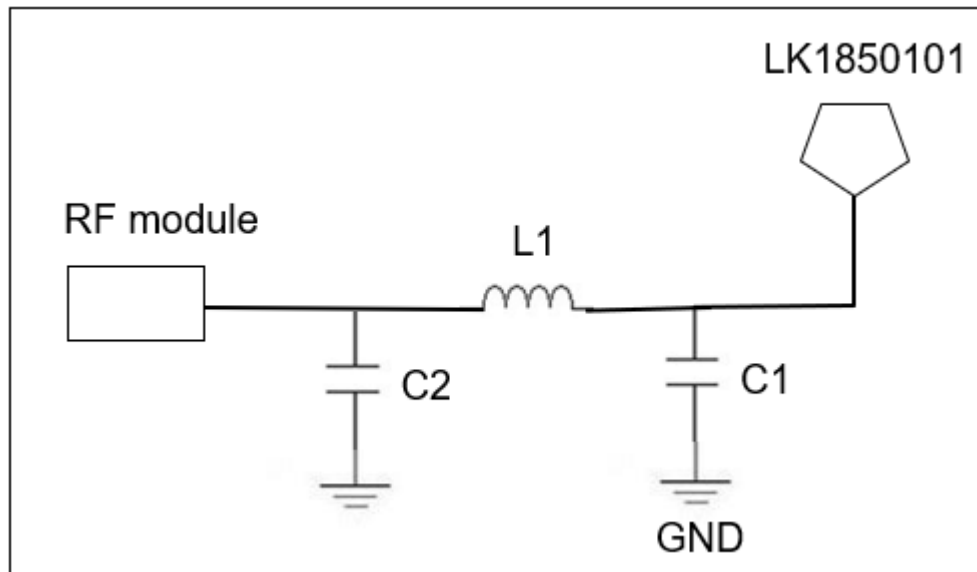


Figure 6.1: The matching circuit schematics of Config A

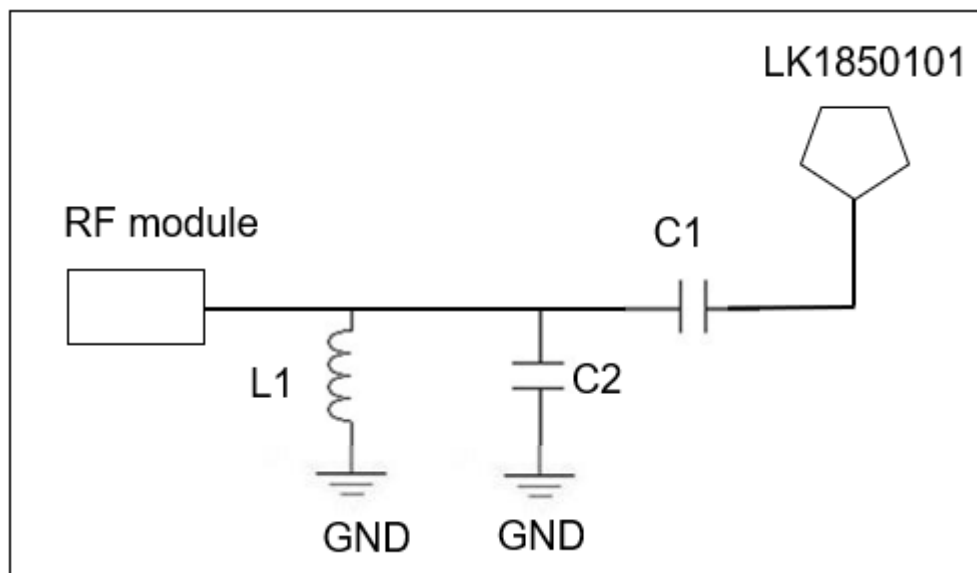


Figure 6.2: The matching circuit schematics of Config B

Table 1: Recommended matching circuit values

Matching circuit		Value	Component size	Part number
Config A	C1	1.3 pF	0402	GRM1555C1H1R3BA01D
	L1	5.6 nH	0402	LQW15AN5N6C10D
	C2	NA	0402	Not Applicable
Config B	C1	8.2 pF	0402	GRM1555C1H8R2BA01D
	C2	6.8 pF	0402	GRM1555C1H6R8BA01D
	L1	1.8 nH	0402	LQP15MN1N8B02D

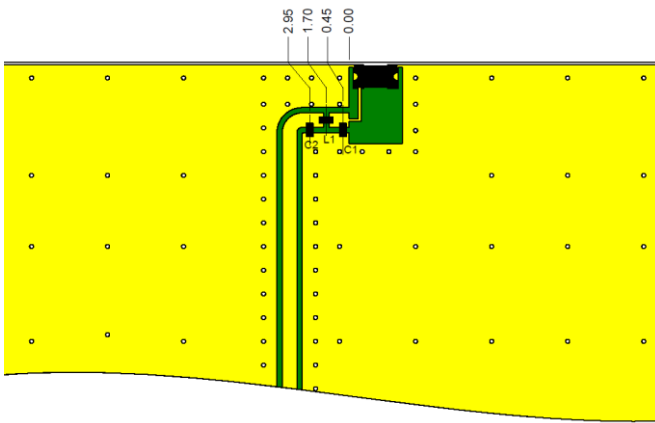


Figure 6.3: Matching location dimensions of Config A

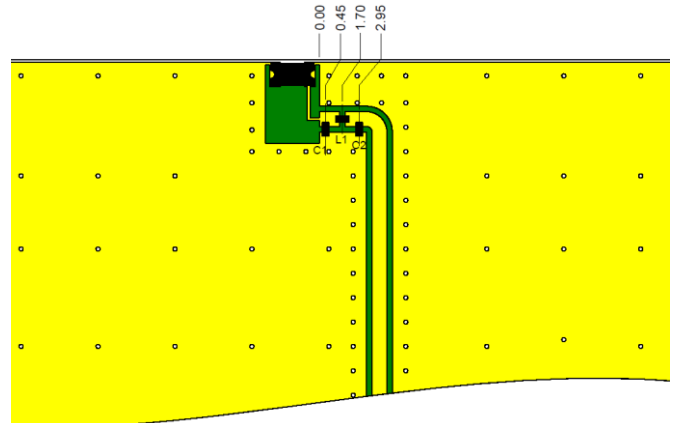


Figure 6.4: Matching location dimensions of mirrored Config A

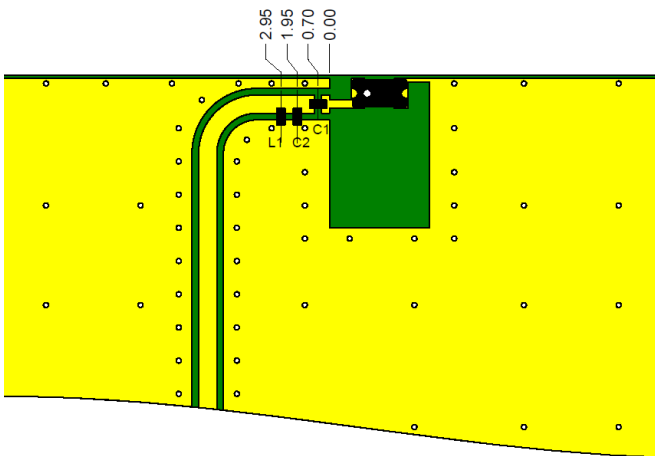


Figure 6.5: Matching location dimensions of Config B

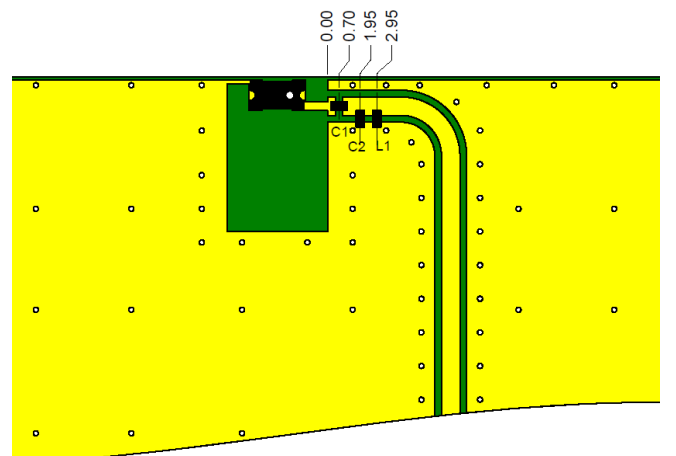


Figure 6.6: Matching location dimensions of mirrored Config B

Notes:

1. The matching values are the same for mirrored application for both Config A and Config B.
2. In real-world device applications, antenna resonance frequencies may be affected by factors such as shielding cans, PCB size and shape, device enclosures, and so on. To compensate for these impacts, slight adjustments to the matching circuit values are necessary. Leankon offers free technical support to designers in order to streamline the development process, which includes:
 - a) Early-phase antenna selection and placement recommendations.

- b) Antenna PCB layout evaluation and recommendations.
 - c) Antenna performance evaluation based on actual applications.
 - d) Matching network optimization in actual devices.
 - e) Passive antenna parameter measurements in actual devices, such as Return loss, Gain, Efficiency, and Radiation pattern, among others.
 - f) Active antenna measurements in actual devices, such as OTA (Over The Air) tests for both TRP (Total Radiation Power) and TIS (Total Isotropic Sensitivity) to reduce the certification risks.
3. Leankon also offers the custom design services for specific applications where off-the-shelf products are not suitable.
4. For more information or technical support, please contact info@leankon.com to speak directly with engineering team.

7.0 Recommended Reflow Profile

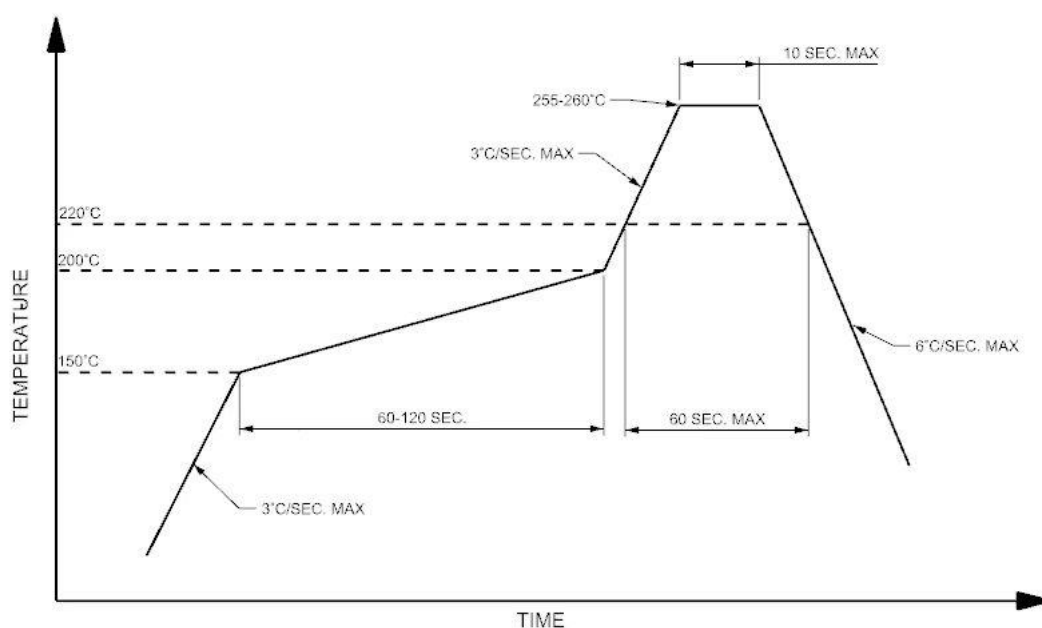
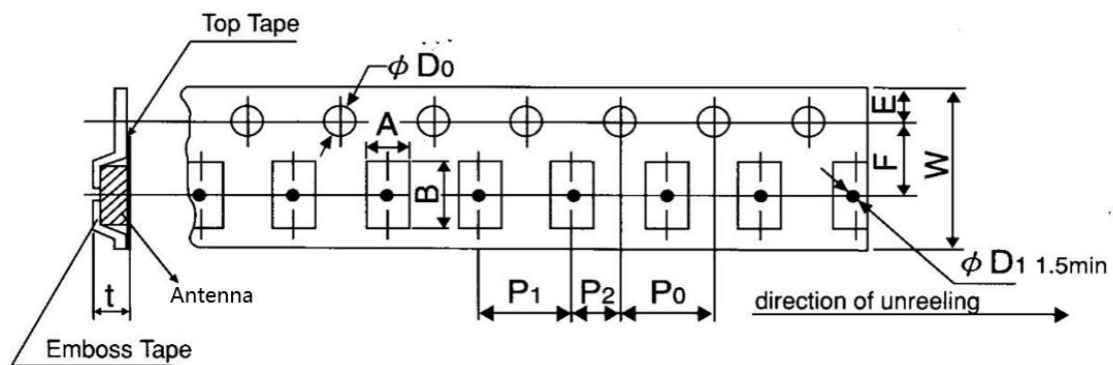


Figure 7.1: Recommended Reflow profile

8.0 Packaging

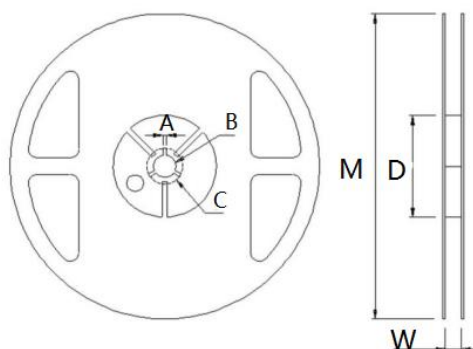
■ Tape dimensions (Unit: mm)

A	B	D0	E	F	P0	P1	P2	W	T
±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.2	±0.15
2.05	3.65	1.55	1.75	3.50	4.00	4.00	2.00	8.00	1.20



■ Reel dimensions (Unit: mm)

A	B	C	D	M	W
±0.5	±0.5	±0.5	±0.5	±3.0	±0.5
2.00	13.5	21.0	60.0	178.0	9.0



9.0 Website and Company Address

Website: www.leankon.com
Address: B1337 1F, Building 3, 5018 Hutai Road, Baoshan District, Shanghai China.

10.0 Revision History

Revision	Date	Description	Issued by:
A	2021-03-06	Initial release	Tony
B	2024-04-09	Reduced the height	Tony

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